WAI ORA

TOP's Policy for freshwater conservation and supply in Aotearoa New Zealand.

August 2020

TOP.
Vote Different

Freshwater Policy

Summary

- Take a land use planning approach to manage the impact of rural and urban land use and discharges on water, which is grounded in natural capital.
- Resolve Te Tiriti o Waitangi issues on the rights and interests of Māori in water so that allocation of water resources (both quality and quantity) can occur.
- Allocate water use and pollution within a Te Mana o Te Wai framework which puts the needs of the wai and the health of the people first, and provides for a reciprocal benefit for the wai.

The situation

New Zealand has a massive problem with the declining health of our fresh water. We have over allocation issues in both quality (too much pollution going in) and quantity (too much water coming out) and reduced habitat (river margins being lost and wetlands being drained).

Water quality is declining in most areas (for example nitrate nitrogen is increasing in 55% of monitored rivers[1]). Native fish species are on the decline (76 percent of our native freshwater fish were either threatened with or at risk of extinction[2]). Our urban rivers are too often sacrificed on the altar of housing growth, piped and built over. The OECD has found that more than half of Auckland's freshwater streams and one-third of marine waters have been ranked 'degraded' or 'poor'[3]; and Nitrate-Nitrogen and E. coli levels in our Urban streams are twice as high as those in pastoral catchments.

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[1] Ministry for the Environment & Stats NZ (2017). New Zealand's Environmental Reporting Series: Our fresh water 2017. Retrieved from www.mfe.govt.nz and www.stats.govt.nz.
[2] Dunn, N.R.; Allibo ne, R.M.; Closs, G.P.; Crow, S.K.; David, B.O.; Goodman, J.M.; Griffiths, M.; Jack, D.C.; Ling, N.; Waters, J.M.; Rolfe, J.R. 2018: Conservation status of New Zealand freshwater fishes, 2017. New Zealand Threat Classification Series 24. Department of Conservation, Wellington. 11 p.
[3] OECD. 2017, OECD Environmental Performance Reviews: New Zealand 2017, OECD Environmental Performance Reviews, OECD Publishing, Paris, https://doi.org/10.1787/9789264268203-en.

The Waitangi Tribunal has found that the current freshwater management regime under the RMA "has allowed a serious degradation of water quality to occur in many ancestral water bodies, which are now in a highly vulnerable state. It was clear to the Crown by 2003–04 at the latest that the RMA was failing to deliver the sustainable management of many water bodies in urban and pastoral catchments."[4]

All of these issues are inter-connected. Water quality, land use, water quantity allocation and loss of freshwater habitat are all related and they need to be addressed holistically, ki uta ki tai – looking at the whole catchment.

The current freshwater management system locks in a reductionist, case by case approach to managing water resources. Looking at issues in isolation isn't working. Looking at activities in isolation using the 'first in first served' RMA resource consent process isn't working. This individual decision making approach to land use and discharge decisions has led to biodiversity being under valued and high-input high-output farming systems and urban sprawl being over valued.

A new approach

We need to take a new approach. That approach needs to identify our environment's capacity, value our land and water, and look to matauranga maori to make decisions within the environment's capacity. RMA reform is already underway and TOP will make sure that this approach is hard wired into that planning legislation to ensure that it is implemented consistently across the country.

Fundamentally, successive governments and regional councils have failed to sustainably manage our freshwaters and have even failed to appropriately measure its decline.

TOP will reform our legislation and national policy and regulation to provide for:

- An approaching to our management of freshwater grounded in natural capital and Te Mana or Te Wai,
- Strong environmental bottom lines,
- Monitoring standards, and
- Oversight by an independent Freshwater/ Te Mana o Te Wai Commission

[4] Waitangi Tribunal (2019) The Stage Two report on the National Freshwater and Geothermal Resources Claim. Wai2358. Pre-publication version. https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_152208791/Freshwater%20W.pdf

But first… resolve Māori rights and interests in water.

The Waitangi Tribunal has found that Māori have outstanding rights and interests in water, and that these rights are akin to ownership and control.[5] They have also found that the governments failure to appropriately manage freshwater, to prevent its ongoing decline in quality and to provide for Māori to make decisions about its manage is a breach of the Te Tiriti o Waitangi. This needs to be addressed urgently.

As well as being an ongoing and contemporary breach of the Te Tiriti lack of resolution of Māori interests in water is also hampering the good management of freshwater for all New Zealanders. Good and fair allocation of the right to use water or to use its ability to assimilate contaminants is key to good management. The government cannot allocate those rights and interests to anybody else until the rights of Māori have been addressed.

Successive governments have kicked this one to touch many times. Its resolution needs to be progressed as a matter of urgency. TOP will only support other freshwater policies that ensure Maori have their Treaty rights over freshwater resolved.

Strong environmental bottom lines.

We need strong centrally developed and enforced environmental bottom lines. The current National Policy Statement for Freshwater (NPSFM2020) is too weak and has too few tangible enforceable bottom lines. We need bottom lines that uphold Te Mana o Te Wai and provide for human, cultural and ecosystem health. We need strong enforceable bottom lines for dissolved oxygen, nitrogen and phosphorus and for deposited sediment.

Freshwater is connected and effects are cumulative[6]. High nitrogen and phosphorus can damage ecosystems, through to increased algal growth that can cause algal blooms that are dangerous for aquatic species, animals and humans. They can also be toxic to humans at high concentrations (>50mg/L), hampering the the ability of blood to carry oxygen around the body ("blue baby syndrome"). Nitrogen levels

[5] Waitangi Tribunal (2012) The Stage One report on the National Freshwater and Geothermal Resources Claim. Wai2358. Legislation Direct, Lower Hutt New Zealand. https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_59941926/Wai2358W.pdf

[6] Ministry for the Environment & Stats NZ (2020). New Zealand's Environmental Reporting Series: Our freshwater 2020. Available from www.mfe.govt.nz and www.stats.govt.nz.

above 1mg/L also put pressure on the health of macroinvertebrates and fish[7]. High nitrate in drinking water has recently been linked with high rates of colorectal cancer at concentrations around 0.8 mg/l of nitrate[8].

Deposited sediment covers the river bed, reducing habitat for aquatic invertebrates that are the main food source for many of our fish species. Sediment entering water ways is also the main way that phosphorus is introduced to freshwater systems, giving algae further fuel to thrive. The algae causes huge fluctuations in dissolved oxygen levels, with supersaturated levels in the daytime when the algae is photosynthesising, but crashes in oxygen concentration overnight, which deprives aquatic life of oxygen and causes fish to die.

Sadly, the latest NPSFM has left dissolved oxygen, phosphorus and deposited sediment to be monitored and managed through non-statutory 'action plans'. It doesn't even include a standards for dissolved inorganic nitrogen. This is despite the government acknowledging that "Nitrogen policies in the current NPS-FM, and councils' implementation of them, are insufficient to provide for ecosystem health, especially in soft-bottomed rivers that do not support the growth of periphyton (algae attached to rocks)." [9]

The decision not to include ecosystem health standards for nitrogen goes against the advice of the majority of the Science Technical Advisory Group (STAG) set up to advise the government on water quality standards. The STAG concurred that there was overwhelming science to support an upper limit of 1 mg/l of nitrogen, with just five members suggesting more work was needed. The government then used this dissenting view as an excuse not to establish a nitrogen limit to protect ecosystem health, but instead to reassess in a years time. This is a cop out. Science doesn't do consensus, questioning and testing ideas is part of the scientific process and is healthy. Waiting for consensus on nitrogen is like waiting for consensus on climate change - while we pander to the minority the situation gets worse.

TOP will put in place a nitrogen bottom line of 1mg/l as recommended by the STAG, and we'll also put in place enforceable bottom lines for all the other measures of ecosystem health recommended by STAG, with no waffly 'action plans'.

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[7] Freshwater Science and Technical Advisory Group. 2019. Report to the Minister for the Environment https://www.mfe.govt.nz/publications/fresh-water/freshwater-science-and-technical-advisory-group-report-minister-environment

[8] Int J Cancer. 2018 Jul 1;143(1):73-79. doi: 10.1002/ijc.31306. Epub 2018 Feb 23. Nitrate in Drinking Water and Colorectal Cancer Risk: A Nationwide Population-Based Cohort Study Jörg Schullehner, Birgitte Hansen, Malene Thygesen, Carsten B Pedersen, Torben Sigsgaard PMID: 29435982 DOI: 10.1002/ijc.31306

[9] May 2020 Cabinet Paper "Action for healthy waterways – Decisions on national direction and regulations for freshwater management" at [93]

Monitoring standards

We also need to develop minimum standards for monitoring the environment, water quality and water quantity. Despite all regional councils having been required to monitor the state of the environment since 1991, there is currently a huge lack of data on the state of our freshwater. In his 2019 review of the environmental reporting system, the Parliamentary Commissioner for the Environment noted, "If there is one thing that stands out from the first cycle of reports, it is the extent of what we don't know about what's going on with our environment."[10]

Not all councils monitor the same thing in the same way, so its difficult to compare between different councils[11]. If we require regional councils to monitor specific things, in specific ways at specific times (as well as set catchment or community specific monitoring goals) we will gain the information we need to understand and manage our water better.

This information needs to be made available to the public easily and regularly so the public can hold decision makers accountable when things are not working. The current Land and Water Aotearoa (LAWA) website should be upgraded and use proper national bottom lines to compare monitoring data.

We also need to properly fund mana whenua to develop national tools and indicators incorporating matauranga māori to understand the health of our water from a māori cultural perspective. We need to fund mana whenua to collect this information, and if it is culturally appropriate to do so, make that information available to the public.

Oversight - Te Mana o Te Wai Commission

Management of our impacts on freshwater is simply too important for it to remain a political football. Successive governments have either kicked the kind of reform we need to touch, or made a hospital pass of it to regional councils. Regional councils have watched over 31 years of declining freshwater health and been successfully lobbied by big agriculture lobbies to dilute badly needed regulation, and by cities to ignore or allow discharges from ancient infrastructure.

[10] Ministry for the Environment & Stats NZ (2019). New Zealand's Environmental Reporting Series: Environment Aotearoa 2019. Available from www.mfe.govt.nz and www.stats.govt.nz

[11] Ministry for the Environment & Stats NZ (2020). New Zealand's Environmental Reporting Series: Our freshwater 2020. Available from www.mfe.govt.nz and www.stats.govt.nz.

We need an independent Freshwater or Te Mana o Te Wai Commission. It would be tasked with providing robust and independent guidance and oversight of both central and regional council implementation of the freshwater management. It would ensure that Te Tiriti principles and Māori values, rights, and interests are fully incorporated into freshwater policy and management.

Setting up a freshwater Commission was recommended to the government by the Land and Water Forum in 2010 and again in 2018[12]. The Waitangi Tribunal has called for a national water commission co-governed with Māori[13]. The establishment of a Commission was supported by the Freshwater Leaders Group[14] and Kahui Wai Māori[15] who advised the government on the 2020 freshwater package. A Freshwater Commission is also supported by Fish and Game[16] and the Environmental Defence Society[17]. The current government say they are still looking at the idea[18].

We need to move from recommending and considering to putting this idea into practice. We need the focused oversight of an independent commission and the careful independent and rigorous monitoring of performance it would provide. Just as the Climate Commission provides independence from short term political gaming on the inter-generational issues of climate change, a Freshwater or Te Mana o Te Wai Commission would do the same for our freshwaters.

Potential roles of a Te Mana o Te Wai Commission -:

[12] Land and Water Forum advice on improving water quality: preventing degradation and addressing sediment and nitrogen - May 2018

[13] The Stage 2 Report on the National Freshwater and Geothermal Resources Claims pre-publication version, Wai 2358, Waitangi Tribunal Report 2019.

[14] Report of the Freshwater Leaders Group to the Minister for the Environment July 2019

[15] Letter from Te Kāhui Wai Māori following the joint-letter of Te Kāhui Wai Māori, the Freshwater Leaders Group, and the Regional Sector Water Subgroup. https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/20200306-39-letter-to-hon-ministers-parker-and-o_connor-%206march-2020docx%20%281%29.pdf

[16]https://www.scoop.co.nz/stories/PO2005/S00364/freshwater-reforms-a-significant-step-forward.htm

[17]https://www.scoop.co.nz/stories/PO2005/S00368/freshwater-reforms-delivered-mostly-as-promised.htm

[18] May 2020 Cabinet Paper “Action for healthy waterways – Decisions on national direction and regulations for freshwater management” at recommendation 190

Te Mana o Te Wai	Regional Councils
Set National Monitoring Standards Audit councils to make sure they are doing monitoring. Analyse national monitoring data and prioritise action. (i.e. allocate funds for planting, retirement of land etc. in places of greatest need).	Carry out monitoring Report to Te Mana o Te Wai Implement recommended actions

Water quantity and allocation.

Situation: The area of irrigated agricultural land in New Zealand almost doubled between 2002 and 2017 from 384,000 hectares to 747,000 hectares. Irrigated land area rose in every region during this time, but the total increase was largely due to the almost doubling of irrigated land in Canterbury (241,000 to 478,000 hectares). In 2017, 64 percent of irrigated agricultural land was in Canterbury. In 2010, 10 of the 29 allocation zones in Canterbury were fully allocated and six were above 80 percent of the allocation limit. Models have shown[19] that the total volume of water consented to be taken from a catchment (apart from use for hydroelectric generation) was greater than the estimated natural median river flows in some parts of Canterbury, Hawke's Bay, and Otago.

Low river flows reduce the quantity of habitat for freshwater fish, invertebrates (like snails and kōura), and other species. In braided rivers, lower flows can reduce the number of channels and consequently the amount of habitat available for threatened birds like wrybill and black stilt (kakī). Reduced flows may increase the concentration of nutrients and other pollutants in a waterway, and can increase water temperatures, especially in streams without shade. All of this is bad news for our aquatic ecosystems.

We need to move to a water allocation framework which is Aotearoa specific, that upholds Te Mana o Te Wai and which assists us to care for and improve our freshwater systems. A Ngā Puna Aroha framework (as described by Taylor et al[20]) would give effect to Te Mana o te Wai for managing water water flows and allocation.

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[19] Booker, D, & Henderson, R (2019). *National water allocation statistics for environmental reporting; 2018.* NIWA, Client Report no. 2019049CH

[20] Taylor, L.B., Fenemor, A., Mihinui, R., Sayers, TA., Porou, T., Hikuroa, D., Harcourt, N., White, P. & O'Connor, M. (2020) Ngā Puna Aroha: towards an indigenous-centred freshwater allocation framework for Aotearoa New Zealand, Australasian Journal of Water Resources, DOI: 10.1080/13241583.2020.1792632

- The first step is to identify the amount of water the waterbody needs to sustain a waterbodies mauri, its values, and its physical health.
- The second step is to identify the amount of water needed to sustain human health including cultural or spiritual health (drinking water for animals and humans, cultural needs including immersion and swimming).
- Then, if there is water available above this, we must consider and manage that as a gift from the water, as opposed to a right. It must be managed well (wisely) and with reciprocity, so everything used has something given in return (improvement or restoration).

This approach means that water is used within its capabilities and is given to future generations with options for their own development.

Where too much water is currently being taken to provide for a waterbodies health - we have a situation of overallocation. In these situations we need to reduce takes to sustainable levels within 20 years. Priority for use of water in over-allocated situations should be given to those water takes necessary for human health (including community supply), and stock drinking water. Second priority should be given to renewable electricity generation to assist us in achieving our climate change mitigation goals. Third priority are water takes that are for other uses, including industrial uses, water bottling and irrigation. Where there is more demand for water than water available for this third priority group, we need to give regional councils the tools and incentives to be able to use mechanisms like auctions or weighted attribute tenders to ensure the water rights go to the best use. Regional councils should set criteria for the use of water that allows them to meet their communities goals, that might be providing jobs, keeping water in New Zealand, or supporting innovative new industries.

All water takes must occur alongside a reciprocal improvement (or gift back) to the waterbody to improve the health of the waterbody. This could include restoring riparian vegetation, or retiring or replanting land elsewhere in the catchment to reduce sedimentation. This could be a cash contribution to a works programme or works itself.

Changes will need to be made to the RMA to provide for this framework. In particular, we need to get rid of first in first served, case by case assessment and allocation entrenched in the current law. The RMA needs to be amended to require councils to consider all takes (and discharges) in a catchment at same time, and allocate available water between them according to the priorities set in a Te Mana o Te Wai framework. We need to give councils the ability to be able to use mechanisms like auctions.

We can adopt a similar approach for water pollution, by defining the water quality needed to sustain a healthy waterbody, and limiting any pollution to only that which does not breach those bottom lines.

But first, of course, before we allocate the right to take water or pollute it, iwi rights and interests in water needs to be resolved. If we are going to be auctioning off rights to take water and assimilate pollution that creates a property right – it is something that has value and can be bought and sold. Māori rights need to be resolved before the system is implemented.

Improving water quality.

Degraded water quality has to be fixed. Water quality issues caused by direct discharges from treated sewage, stormwater or industry need to be fixed by upgrading treatment systems and infrastructure to best practice. We've got a plan to fund the upgrades needed to the aging infrastructure of our towns and cities in our Building and Housing Policy.

Rethinking land use – a natural capital approach

The other source of pollution of water is our land use. We need to change the way we manage our land to ensure that use is having a light footprint on our water. We need to make sure we've got the right farm type in the right place and that we're operating those farms within the environment's capacity.

No one single farm system is causing our water bodies to be degraded. It's a collective issue and it needs a collective response.

Natural capital is our stock of natural resources, which includes geology, soils, air, water and all living organisms. These underpin the ability of our environment to generate ecosystem services.

A natural capital approach for managing land and water resources would have as a goal that there should be no loss of natural capital from our use of resources and aim to increase natural capital over time. In this way we can leave our environment for the next generation in a better state than we inherited it.

An excellent knowledge of our natural capital would form a basis for catchment scale land use planning to support catchment and farm based responses to water quality issues.

Farm and Catchment planning

The best way to match land use to the land, is proper catchment planning with proper farm planning used as a tool to achieve those catchment goals.

Farm plans are great, they are really the only way to really understand what's going on on a farm and what needs to be done and to set priorities. The trouble is, so many farm plans currently getting written are too inward looking. They focus on what's happening on the farm, but don't look outwards to see what is happening around them. To be effective farm plans need to be based on an understanding of what needs to be done at the catchment scale, and what the individual farm can do to contribute to that.

Supporting catchment communities to work together to come up with catchment goals (consistent with national bottom lines) and catchment plans (to achieve those goals) is vital. Providing catchment groups and farmers with experienced facilitators and access to science, understanding of natural capital and mapping will put them on the path to success.

Then we can use regulation for what it's really good at – chasing up the laggards.

Understanding and mapping Natural capital.

To manage the land really well we need to know what we've got. We need to have an excellent and freely available resource to guide land use planning, that identifies the strengths and vulnerabilities of our natural landscape.

We can use existing resources as well as new and emerging technologies (including satellite imagery, LiDAR and drone mapping) to map terrain and slope at a detailed scale and to map land and vegetation at a high-resolution or property scale.

Using this and other existing information we can map opportunities (eg. great productive land) and constraints (eg. erodible land) and risks (eg. sensitive water bodies) and opportunities (eg. wetland restoration possibilities).

Using this information we can identify land with constraints to use, for example that Class 8 erodible land is not suitable for productive uses and should be retired or that erodible land near waterbodies and critical source areas is at high risk for putting sediment into rivers.

Land use suitability tools for the entire country have been piloted in Southland and Hawkes Bay through the Our Land and Water National Science Challenge[21] . LiDAR mapping is being used in Southland to identify critical source areas, and in Canterbury to identify sites where inanga (one of our endangered native fish that contributes to the whitebait catch) spawn[22]. We need to continue funding and developing programmes like these to build a nationwide resource.

What is land-use suitability?

"Land-use suitability planning aims to move away from the historical emphasis on what land is capable of producing in terms of profitability, to a consideration of four values: economics, environmental, social and cultural consequences." (Scott Larned, NIWA ecosystems ecologist with NIWA, and leader of the land-use suitability research programme).

"Land might be capable of having an activity on it, but is it suitable? If we put the right kind of land uses in the most suitable country, that will minimise our footprint." (Robyn Dynes, who leads the next generation systems research programme and is a farm systems scientist at AgResearch).

See https://ourlandandwater.nz/future-landscapes/land-use-suitability/

Use the natural capital mapping information to make decisions about land use, catchment and farm planning.

We can use the information gathered through natural capital mapping to identify capabilities and constraints and use this information to direct our land use planning. We can then:

- direct land use to appropriate areas. For example, land uses with a high risk of leaching nitrogen to water should not be located on 'leaky' soils or near highly sensitive waterbodies (such as lakes) and estuaries.
- identify priority areas for restoration (wetlands, riparian margins) and land use change.

[21] Scott T. Larned, Jonathan Moores, Jenni Gadd, Brenda Baillie & Marc Schallenberg (2019) Evidence for the effects of land use on freshwater ecosystems in New Zealand, New Zealand Journal of Marine and Freshwater Research, DOI: 10.1080/00288330.2019.1695634

[22] Greer, M., Gray, D., Duff, K. & Sykes, J. 2015. Predicting inanga/whitebait spawning habitat in Canterbury. Environment Canterbury Regional Council Report No. R15/100.

- Identify areas where farmed animals need to be kept out of rivers, lakes and wetlands, with high degree of accuracy.

Identifying priority areas for restoration and for stock exclusion through detailed mapping and planning will allow us to target the effort and spend of fencing and restoration to the areas at highest risk and where the benefits will be of the highest value.

Similar tools will work for directing urban growth as well. Most of our urban growth should be accommodated by increasing density rather than sprawl, but where extra land is needed natural capital mapping can direct urban growth areas:

- Away from highly productive soils,
- Away from erodible soils,
- Away from areas where stormwater goes into sensitive lakes, rivers or estuaries.

This links to TOP housing policy on spatial planning for housing and weaves urban housing and development into its environment.

Support alternative land use options

Once we have identified opportunities and constraints and identified long term collective goals, we need to make sure we operate within them. Catchment and farm planning is key to this. Groups of landowners working together with their communities to identify opportunities for improvement and being resourced to implement those changes is key.

The good news is there are lots of examples of this happening all around the country, with catchment groups supported by Industry, Regional Councils [23], [24], and NZ Landcare Trust[25]. We need to continue to support this happening at a national scale.

Resources for farmers to optimise their farm systems, to use technology to improve profitability and reduce footprint need to be made freely available. For example, mapping of water and nutrient application, coupled with remote probes to measure soil moisture can ensure only the water and nutrients required by crops are applied, to prevent excess water extraction and nutrient leaching. One study conducted on a

[23] for example: https://beeflambnz.com/catchment-groups/groups-and-facilitators?type=catchment_group&title=
[24] For example: https://www.fonterra.com/nz/en/what-we-stand-for/environment/water/sustainable-catchments/catchments.html
[25] 'Catchment Management: Working Together' Produced by NZ Landcare Trust PO Box 4305, Hamilton 3247 www.landcare.org.nz

farm in Ranfurly, Central Otago, found that variable rate irrigation could reduce downstream nitrogen and phosphorus loads by up to 85 per cent.

Strong environmental bottom lines do not have to spell financial ruin for our primary producers. Studies show over and over again that low impact systems can often be our most profitable. For example:

- A 2009 AgResearch study found that compared a low-input system in the Waikato to conventional systems had the lowest greenhouse gas emissions, lowest nitrate leaching rates and the highest energy efficiency; and the highest milk production per cow, highest profitability when milk prices were low and maize prices were high and was the least financially risky in terms of profit due to fluctuating input prices[26].
- A 2019 modelling study by the Landcare Trust compared farms with varying stocking rates, fertiliser use and imported feed. It found that the farm with the lowest synthetic fertiliser use and the second smallest herd had the largest increase in profitability (29%) and the lowest environmental footprint, a 13% reduction in nitrate leaching and an 18% reduction in GHG emissions[27].

We can have productive and sustainable primary sector and clean rivers. We don't have to choose.

A Just transition.

The great news is that for many of our catchments optimising and adapting current farm systems to operate with the natural capital of the land will be enough to reach or remain at our water quality goals. 70-90% of our river reaches (measured by length) already meet the necessary bottom-lines for nitrogen, phosphorus or ecosystem health (measured by macro-invertebrate community index).

For some places, improving water quality is going to be a big challenge. No amount of precision agriculture is going to make industrial scale irrigated dairy farming on the gravel plains of Canterbury sustainable. We are going to have to achieve the land use change necessary in those areas by requiring and incentivising the change.

We need to invest more in research and development of alternative land uses. Truly sustainable land uses will benefit our environment, our communities, improve our climate change resilience and help achieve our goals of a carbon zero future. Money currently being poured into irrigation dam projects in the regions (more than $73 million has been allocated to water storage projects by the Provincial Growth

[26] Basset-Mens, C., Ledgard, S. and Boyes, M., 2009. Eco-efficiency of intensification scenarios for milk production in New Zealand. Ecological economics, 68(6), pp.1615-1625.
[27] A.J. Litherland (NZ Landcare Trust), B. Riddler (E2M modelling), M.Langford (Fonterra), M Shadwick (DairyNZ) Finding a win- win for the farmer and the environment.

Fund) should be redirected to developing markets and processing for alternative climate and river friendly products.

Using Natural Capital Mapping we can refocus the 'one billion trees' money to prioritise trees that are for environmental restoration, in locations where re-vegetation is a priority (rather than planting whole farms, or only planting in areas where landowners find enough time to apply to the fund). We can put trees on highly erodible land, in riparian margins and targeted on at risk land within properties to keep the productive potential of the remainder of the land. Vegetated riparian margins are effective pollution mitigations and can become vegetated corridors connecting other areas of high biodiversity value (including wetlands).

What is the cost of riparian planting all waterways?

Riparian tree planting provides increased filtration of Nitrogen & Phosphorus over grass alone*, provides habitat for aquatic species, and biodiversity corridors for terrestrial wildlife, creates stream shade (which reduces growth of algae and aquatic weeds and keeps water cooler), and sequesters carbon. The wider the margin the better the environmental outcomes, though this begins to tail off at 10m width, and plateaus at around 25m width.

The Government estimates there are 32,000 km of waterways that will have to be fenced by 2025 under the NPSFM-2020. The majority of this is on sheep and beef farms. If all of these are planted, even just the the narrow 3m wide riparian margins required under the NPSFW 2020 riparian planting might cost in the region of $312 million; $120 million of which is labour.**

A 2017 study*** modelled the costs and benefits of riparian planting of all of New Zealand's permanent streams with primary sector land (348,000 km - just a wee bit more than the government estimate) and found that the environmental benefits to climate and freshwater are greater than the implementation costs of riparian restoration by a minimum factor of 1.4 to as much as 22.4. Even at the widest margins modelled (up to 50m) the benefits far outweighed the costs.

Planting our riparian margins will provide employment opportunities, and environmental benefits that far outweigh the cost. It's really a no-brainer.

*Zhang, X., Liu, X., Zhang, M., Dahlgren, R.A., Eitzel, M., 2010. A review of vegetated buffers and a meta-analysis of their mitigation efficacy in reducing nonpoint source pollution. J. Environ. Qual. 39, 76-84. doi:10.2134/jeq2008.0496

**32,000km x 6m wide = 19,200 ha. Using 2m plant spacing (2500 plants/ha) and a cost/plant of $6.50 ($4 per plant, and $2.50 preparation and planting) = $312,000,000 . ($192 million in plants, $120 million in labour).

***Daigneault, A. J., Eppink, F.V.& Lee, W. G. (2017). A national riparian restoration programme in New Zealand: Is it value for money? Journal of Environmental Management 187 (2017) 166-177. https://doi.org/10.1016/j.jenvman.2016.11.013

High intensity land uses could be dis-incentivised by requiring reduction in intensity or a cap on nitrogen fertiliser or stocking rates. Land identified as not suitable for cultivation or heavy stock must be removed from that use or a comprehensive

management plan prepared and complied with to manage the risk within the catchment.

We will also need to provide time for the transition. We can't change our farming systems over night, and it's not reasonable to ask for that. But we do need to deliver on our responsibility to our future generations to clean up our mess within a generation.